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while every character observed in a phylum of extinct mammals is found to be kinetic or in a state of motion.

Palæontology reveals many other paradoxes, unsuspected by zoology. For example, unprotected animals which may be breeding very rapidly and varying widely, like the mice, may be evolving very slowly, while highly protected mammals which are breeding slowly, like the elephants, may be evolving very rapidly. In these and many other animals, as recently pointed out by Conklin, there is an inverse ratio between the law of selection (survival and elimination) and the rate of adaptive evolution. This shows that in Nature evolution is not hastened by rapid breeding and selection, but that rapid evolution may be due to other causes.

American Museum of Natural History, New York City.

A NOTE ON THE HABITS OF THE TIMBER WOLF

BY CHARLES EUGENE JOHNSON

Opportunities for close-up view of the wild timber wolf in action are, I believe, sufficiently rare to justify submitting the following notes.

The summer of 1912 was spent in making some studies and collections of mammals in northern Lake County, Minnesota, in a portion of the Superior National Forest. The evening of September 1, my companion, Harold N. Hanson, and I, traveling by canoe, returned to one of our main camps after a four days' absence in a more remote locality. As we pulled up at our landing place, which was at the upper end of a rapids and about half a mile from our camp, we observed numerous wolf tracks in the mud along the river bank; these had not been there when we left camp a few days before. But it was now after sundown and too late for further investigation.

The next day a strong northwest wind was blowing and at 3:30 in the afternoon, taking a couple of large traps and my rifle, I set out to discover if possible the meaning of the many wolf tracks. Upon approaching the landing place I moved very cautiously, more as a matter of habit than with any expectation of seeing anything unusual. Just before emerging into the open space by the landing I caught the sound of gentle splashing in the water and, peering through a little opening in the bushes, I saw a timber wolf in the river, stationary, but rising and falling as if "treading water" and taking savage bites at a large body

which was afloat but apparently anchored in the stream. For a few moments I stood intently gazing at this unexpected sight before it became clear to me that the animal was feeding upon something. Thereupon, with eyes still fixed upon the wolf I proceeded as cautiously and as speedily as possible to deposit my traps upon the ground, but before I was able to free myself entirely of the encumbrance a slight clank of the metal sounded and, instantly pricking up its ears, the wolf ceased its exertions and started for the shore, swimming towards me, obliquely to my left. This shore for the wolf was not more than about ten feet distant. Hastily but with the utmost confidence I took aim through the swaying leafy branches and fired just as the wolf was about to disappear behind a large boulder at the edge of the water. My next move was to run quickly out upon a drift-log in the only immediately accessible part of the river in order to have the animal in view and to get in another shot if necessary. When I reached the log I saw the wolf standing motionless on the shore, its head and shoulders concealed behind some bushes, facing diagonally away from me. Steadying myself with as much alacrity as the uncertain footing would permit I fired at the exposed body only to see the wolf flinch and disappear in the thick woods, to be seen or heard no more.

Upon my return after an attempt to track the beast I inquired into the failure of my first shot and discovered that the bullet had struck the projecting edge of a rock concealed by the foliage. The wolf when it landed was therefore untouched. Its hesitation on the bank, while it seemed the height of cool nerve and presence of mind, was no doubt due merely to a momentary bewilderment and uncertainty as to the direction in which the danger lay. The noise from the rapids together with the high wind clearly rendered it difficult to tell the direction of the shot as well as of the lesser disturbance caused by myself in rushing out from the bushes and onto the drift-log. The animal was furthermore entirely dependent upon the sense of hearing in this instance, for it seemed certain from all appearances that the wolf had not had even a glimpse of my person during the entire time up to the moment when my second shot was fired, and possibly not then. That it swam to my side of the river instead of retreating to the opposite bank was probably also due to its inability to accurately locate the source of the first disturbance; but on the other hand this shore was the nearer, the other being fully three times as far away. In looking over the situation later I found that at no time had the wolf been more than about forty feet distant from me and that when the first shot was fired it was

approximately twenty-five feet away. Its size indicated a full-grown animal.

The floating object upon which the wolf had been feeding proved to be an adult cow moose, recently dead. It lay in a pool about six or seven feet deep, but a short distance above the swift water of the rapids and was held in place by a long pole lying crosswise in the current. The nearer shore would probably have presented some difficulty in landing for an animal the size of a moose because of a number of large boulders at the edge of the water, while upstream passage was entirely barred by a mass of drift; but the opposite bank offered easy hauling-out places down as far as the turbulent water of the rapids. Whether the moose had accidentally drowned or had died suddenly from some natural cause while in the river to feed is a matter of speculation, and the possibility remains that the cow had been frightened or driven into the river by wolves and had there floundered about until exhausted. In the back, opposite the kidneys, a large deep hole had been eaten into the carcass and it was here the wolf was feeding when surprised. No other part of the moose, so far as could be observed in the difficult situation, bore any signs of attack.

On August 14 of the present year another opportunity presented itself for a near view of a timber wolf in its native haunts, this time with more disastrous termination for the wolf. It was in the same general region of the Forest Reserve but further out, namely on the upper courses of the Isabella River, at what is known as Rice Lake. Accompanied by my wife I was spending a few weeks' vacation in some further observations in that territory, under federal and state permits.

At 10:30 in the forenoon on the date mentioned we were on our way, by canoe, for a day's exploration about the shores of Rice Lake and had stopped to fish for a little while in a favorable spot in the Isabella River, at the entrance into the lake. Below this point the river is flanked on each side by a meadow of grass and low shrubbery extending back at different points from perhaps twenty-five to a hundred or more yards before the timberline proper is reached. While thus quietly engaged we noticed an animal moving along the edge of the river on the east bank, about three hundred yards down stream. A glance through the field glass revealed it as a wolf and it was then moving at a slow trot. We determined to follow it on the chance that an opportunity for a near approach should present itself, for although we were but poorly equipped, our only arm being a little 410-gauge shot-gun, we

had the day before prepared for just such an emergency by loading a couple of shells with two small buck-shot, in addition to the regular "dust shot" they contained which served as "packing." By good fortune I had these two shells in my pocket.

Hastily drawing in our line we paddled rapidly but cautiously down river. We had not covered a quarter of the distance when the wolf disappeared from view, having, we feared, caught sight of us; for the slight breeze that was blowing was in our favor and there was little likelihood that the animal had scented us at that distance. We nevertheless continued towards the spot where it had last been seen and when about a hundred yards distant waited and listened. After what was perhaps not more than two or three minutes we were rewarded by the sound of rustling grass and bushes and the wolf burst into full view directly in front of us. It was now loping, beating after the manner of a hunting-dog and clearly in search of small prey. A number of times as we watched it would turn and trot back a little way to sniff and re-examine hurriedly some spot that it had just passed. Again it would make a short detour into the meadow and be lost from view for what seemed minutes, and each time this happened we feared it would not return; but it always came rushing back to the water's edge to continue on its way, as if it had a definite destination toward which it was heading but could not resist the temptation of a few side excursions en route.

In the meantime we had been urging our canoe nearer and nearer and, by taking advantage of our opportunities when the wolf was for the moment concealed by the tall grass or pre-occupied with its investigations, had by this time approached to within perhaps sixty or sixty-five yards. The wolf was in full view much of the time and it seemed that it must be only the matter of seconds before we should be detected. Two or three times the animal turned on its quartering course and came back a few steps almost directly toward us and I each time carefully laid down my paddle and raised the little gun ready to pull the trigger on the instant that the wolf should show signs of seeing us; for although there was not the slightest chance that two buck-shot might find a vital spot at that distance I felt that we ought not to deny ourselves what satisfaction we might get out of frightening the beast to the utmost of our ability. But the wolf turned and resumed its running hunt, its attention apparently concentrated upon the ground in its immediate proximity.

We followed in the rear and on its left flank. We had been gaining considerably and were not more than forty yards away. The wolf's mouth was open and its tongue slightly extended from its restless activity. At this moment it turned broadside and trotted out onto a little point of land ahead of us. The river is here about seventy-five feet wide but rather shallow, the main channel, which is about fifty feet across, having a depth of only about two and a half or three feet. Without a moment's hesitation the wolf walked deliberately into the river and started swimming. My wife and I stuck our paddles in the bottom and held still, tingling with keenest expectations. Restraining ourselves until the wolf had nearly reached the middle of the channel we shoved ahead and with our best efforts at silence raced to overtake the beast before it should reach the opposite bank, our course lying at an angle of about forty-five degrees.

We had come to within perhaps twenty-five feet of the animal and it was fast nearing the shallow water before it suddenly beheld the rapidly approaching canoe. Abruptly it ceased swimming and for a brief second glared fixedly at the strange sight; then it turned hurriedly about and started back towards the shore it had just left. Checking ourselves we set a diagonal course and with a few vigorous strokes brought up within six or eight feet of the wolf as it now crossed our bow in desperate exertions to reach the land. The little shot gun held true at this distance and both buck-shot entered the brain. The wolf's head sank instantly at the report but its momentum was such that its body doubled up and turned almost completely over in the water.

The wolf proved to be a young male, heavy-boned and in splendid condition. It measured 3 feet, 10 inches, including the tail which was 13 inches long. We had no means for weighing but estimated the weight at about 35 pounds. When the stomach was opened it was found to be completely filled with hair and several pieces of hide of a moose. No other kind of food had apparently been devoured that morning, although the wolf was clearly beating for smaller prey when observed. The pieces of moose hide still had the hair firmly attached but were evidently the dried parts of the skin of an animal that had been dead for some time.

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